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For: MOBILE TERMINAL DEVICE HAVING ROUTE GUIDING FUNCTION AND ROUTE GUIDING METHOD UTILIZING MOBILE TERMINAL DEVICE

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Sir,

I, Toshimasa SUZUKI, hereby declare that I am conversant with both English and Japanese languages, and certify to best of my knowledge and belief that the attached is a true and faithful translations made by me of Japanese Application No. 2003-041022 filed on February 19, 2003 on which the rights of priority under the International Convention are all claimed for the above-identified application.

Toshimasa SUZUKI

Date: January 31, 2007

PATENT OFFICE

Japanese Government

This is to certify that the annexed is a true copy of the following application as filed with this office.

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[Title of the Invention] Mobile Terminal Device Having Route Guiding Function and Route Guiding Method Utilizing Mobile Terminal Device

[Claims]

[Claim 1] A mobile terminal device having a route guiding function of guiding a route by obtaining map information from a server system via a radio communication network, comprising:

a position sensing means for sensing a current position of the mobile terminal device;

a bearing sensing means for sensing a bearing to which the mobile terminal device is directed;

a map information acquiring means for transmitting predetermined specific information to identify a destination and positional information of a present address to the server system, and acquiring map information of a section containing the destination and the present address from the server system;

a target bearing calculating means for calculating a bearing from a current position to the destination from the positional information of the present address and the specific information of the destination;

a displaying means for displaying a map based on acquired map information, displaying predetermined icon images at a position of the destination and the current position respectively, and displaying an icon image indicating a bearing to which the mobile terminal device is directed; and

a target capturing means for producing a sound effect in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[Claim 2] A mobile terminal device having a route guiding function of guiding a route by obtaining map information from a server system via a radio communication network, comprising:

a position sensing means for sensing a current position of the mobile terminal device;

a bearing sensing means for sensing a bearing to which

the mobile terminal device is directed;

a map information acquiring means for transmitting predetermined specific information to identify a destination and positional information of a present address to the server system, and acquiring map information of a section containing the destination and the present address from the server system;

a target bearing calculating means for calculating a bearing from a current position to the destination from the positional information of the present address and the specific information of the destination;

a displaying means for displaying a map based on acquired map information, displaying a predetermined icon image at least in the current position, and displaying an icon image indicating the bearing to which the mobile terminal device is directed and an icon image indicating the bearing from the current position to the destination; and

a target capturing means for producing a sound effect in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[Claim 3] A mobile terminal device having a route guiding function according to claim 1 or claim 2, wherein the target capturing means produces different melodies in response to the difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[Claim 4] A mobile terminal device having a route guiding function according to claim 1, wherein the target capturing means blinks further the icon image displayed at the position of the destination when the bearing from the current position to the destination coincides with the bearing to which the mobile terminal device is directed.

[Claim 5] A route guiding method utilizing a mobile terminal device, comprising the steps of:

providing a map database, to which the mobile terminal device is connected via a radio communication network, to a

server system that stores map information consisting of map image data and information to identify a position on a map every predetermined section, and also providing a position sensing means for sensing a current position pf the mobile terminal device and a bearing sensing means for sensing a bearing to which the mobile terminal device is directed to the mobile terminal device;

causing the server system to execute the steps of

searching the map information containing a destination and a present address from the map database, based on positional information of the present address transmitted from the mobile terminal device and specific information of a destination, and

sending back searched map information to the mobile terminal device; and

causing the mobile terminal device to execute the steps of

transmitting predetermined specific information pointed by a user to the server system,

transmitting the positional information of the present address sensed by the position sensing means to the server system,

receiving the map information sent back from the server system,

calculating a bearing from the current position to the destination from the positional information of the present address and the specific information of the destination,

displaying a map based on acquired map information, displaying predetermined icon images to overlap with a position of the destination and the current position, and displaying an icon image indicating a bearing to which the mobile terminal device is directed, and

producing a sound effect in response to a difference between a bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[Claim 6] A route guiding method utilizing a mobile

terminal device, comprising the steps of:

providing a map database, to which the mobile terminal device is connected via a radio communication network, to a server system that stores map information consisting of map image data and information to identify a position on a map every predetermined section, and also providing a position sensing means for sensing a current position pf the mobile terminal device and a bearing sensing means for sensing a bearing to which the mobile terminal device is directed to the mobile terminal device;

causing the server system to execute the steps of

searching the map information containing a destination and a present address from the map database, based on positional information of the present address transmitted from the mobile terminal device and specific information of a destination, and

sending back searched map information to the mobile terminal device; and

causing the mobile terminal device to execute the steps of

transmitting predetermined specific information pointed by a user to the server system,

transmitting the positional information of the present address sensed by the position sensing means to the server system,

receiving the map information sent back from the server system,

calculating a bearing from the current position to the destination from the positional information of the present address and the specific information of the destination,

displaying a map based on acquired map information, displaying a predetermined icon image at least at the current position, and displaying an icon image indicating a bearing to which the mobile terminal device is directed and an icon image indicating a bearing from the current position to the destination, and

producing a sound effect in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention Belongs]

The present invention relates to a mobile terminal device having a route guiding function and a route guiding method utilizing the mobile terminal device.

[0002]

[Prior Art]

Up to now, the mobile phone with a map navigation function, to which a GPS function of sensing a current position and a bearing compass function using a geomagnetic bearing sensor are provided, etc., are manufactured as a product.

In contrast, as the invention of the navigation system utilizing the mobile terminal device such as the mobile phone, or the like, there is the invention set forth in Patent Literature 1, for example. According to this, the user's terminal side acquires positional information of the present location by using the GPS, then sets positional information of the destination by using a function of the service server, and then makes out the guide route via the service server, while the service server offers sequentially positional information of transit points in the middle of the guide route to the destination every time the user arrives at each transit point until the user comes up to the destination. Then, the user's terminal derives the guiding direction indicating the direction of the halfway targets required until the user arrives at the destination and also detects the direction in which the LCD is directed from the positional information received from the service server, then detects the guiding direction indicating the direction of the destination with respect to this direction by the relative direction, and then transmits this direction by an arrow or a sound to the user. With this configuration,

the invention set forth in Patent Literature 1 is able to guide the direction to the destination without map information that needs a large information contents.

[0003]

[Patent Literature 1]

JP-A-10-197277

[0004]

[Problems that the Invention is to Solve]

In the case of the foregoing prior art, since normally the top portion of the displayed map points the North bearing, the user must appreciate previously that the upper side of the displayed map is directed to the North bearing to find the user's destination. As the case may be, the user must find where the land mark indicated on the map is actually located. Also, the user must appreciate at which place the user's own current position is located on the map and in which direction the position of the destination on the map is placed relatively from the user's own current bearing (the current direction of the mobile terminal device). For the above reasons, in order to arrive at the position of the destination from the user's own current position, it took the user a lot of time to decide which way the user should at first start to walk along.

Also, in the map navigation function, in case such a mode is taken that the map information is downloaded from the server, first a wide area map must be downloaded in the prior art, and then the area of the map must be reduced several times by using the zoom-in function to get a map range containing the destination and the user's own current position. Otherwise, map information with different map scales must be downloaded several times, and thus it is very troublesome to execute such function.

[0005]

Also, in the technology set forth in Patent Literature 1, the system is downsized according to the above configuration, nevertheless the user acquires the positional information of the next destination via the communication with the service

server every arrival of the halfway destination on the guide route until the user comes up to the final destination without the map. Therefore, the user must communicate with the service server until the user comes up to the final destination. As a result, in case the user positions in the environment to cause the communication trouble, the guidance to indicate the next destination is not properly issued, so that in some cases the user fail to reach the final destination. Also, in case the proper guide route is not derived and thus the guiding direction is given in disregard of the presence of the actually existing building, etc., it may happen that the user cannot know in which way he or she should actually go, e.g., the situation that the user cannot go in that direction because of the building, etc. located in the guiding direction.

[0006]

The present invention has been made in view of the above circumstances, and it is an object of the present invention to provide a mobile terminal device having a route guiding function of permitting the user to simply know a direction of a target based on user's current position and direction, and a route guiding method utilizing the mobile terminal device.

[0007]

[Means for Solving the Problems]

The invention set forth in Claim 1 provides a mobile terminal device having a route guiding function of guiding a route by obtaining map information from a server system via a radio communication network, which comprises a position sensing means for sensing a current position of the mobile terminal device; a bearing sensing means for sensing a bearing to which the mobile terminal device is directed; a map information acquiring means for transmitting predetermined specific information to identify a destination and positional information of a present address to the server system, and acquiring map information of a section containing the destination and the present address from the server system; a target bearing calculating means for calculating a bearing from

a current position to the destination from the positional information of the present address and the specific information of the destination; a displaying means for displaying a map based on acquired map information, displaying predetermined icon images at a position of the destination and the current position respectively, and displaying an icon image indicating a bearing to which the mobile terminal device is directed; and a target capturing means for producing a sound effect in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[0008]

Also, the invention set forth in Claim 2 provides a mobile terminal device having a route guiding function of guiding a route by obtaining map information from a server system via a radio communication network, which comprises a position sensing means for sensing a current position of the mobile terminal device; a bearing sensing means for sensing a bearing to which the mobile terminal device is directed; a map information acquiring means for transmitting predetermined specific information to identify a destination and positional information of a present address to the server system, and acquiring map information of a section containing the destination and the present address from the server system; a target bearing calculating means for calculating a bearing from a current position to the destination from the positional information of the present address and the specific information of the destination; a displaying means for displaying a map based on acquired map information, displaying a predetermined icon image at least in the current position, and displaying an icon image indicating the bearing to which the mobile terminal device is directed and an icon image indicating the bearing from the current position to the destination; and a target capturing means for producing a sound effect in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[0009]

Also, in the invention set forth in Claim 3, in the mobile terminal device having a route guiding function according to Claim 1 or Claim 2, the target capturing means produces different melodies in response to the difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[0010]

Also, in the invention set forth in Claim 4, in the mobile terminal device having a route guiding function according to Claim 1, the target capturing means blinks further the icon image displayed at the position of the destination when the bearing from the current position to the destination coincides with the bearing to which the mobile terminal device is directed.

[0011]

Also, the invention set forth in Claim 5 provides a route guiding method utilizing a mobile terminal device, which comprises the steps of providing a map database, to which the mobile terminal device is connected via a radio communication network, to a server system that stores map information consisting of map image data and information to identify a position on a map every predetermined section, and also providing a position sensing means for sensing a current position pf the mobile terminal device and a bearing sensing means for sensing a bearing to which the mobile terminal device is directed to the mobile terminal device; causing the server system to execute the steps of searching the map information containing a destination and a present address from the map database, based on positional information of the present address transmitted from the mobile terminal device and specific information of a destination, and sending back searched map information to the mobile terminal device; and causing the mobile terminal device to execute the steps of transmitting predetermined specific information pointed by a user to the server system, transmitting the positional

information of the present address sensed by the position sensing means to the server system, receiving the map information sent back from the server system, calculating a bearing from the current position to the destination from the positional information of the present address and the specific information of the destination, displaying a map based on acquired map information, displaying predetermined icon images to overlap with a position of the destination and the current position, and displaying an icon image indicating a bearing to which the mobile terminal device is directed, and producing a sound effect in response to a difference between a bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[0012]

Also, the invention set forth in Claim 6 provides a route guiding method utilizing a mobile terminal device, which comprises the steps of providing a map database, to which the mobile terminal device is connected via a radio communication network, to a server system that stores map information consisting of map image data and information to identify a position on a map every predetermined section, and also providing a position sensing means for sensing a current position of the mobile terminal device and a bearing sensing means for sensing a bearing to which the mobile terminal device is directed to the mobile terminal device; causing the server system to execute the steps of searching the map information containing a destination and a present address from the map database, based on positional information of the present address transmitted from the mobile terminal device and specific information of a destination, and sending back searched map information to the mobile terminal device; and causing the mobile terminal device to execute the steps of transmitting predetermined specific information pointed by a user to the server system, transmitting the positional information of the present address sensed by the position sensing means to the server system, receiving the map

information sent back from the server system, calculating a bearing from the current position to the destination from the positional information of the present address and the specific information of the destination, displaying a map based on acquired map information, displaying a predetermined icon image at least at the current position, and displaying an icon image indicating a bearing to which the mobile terminal device is directed and an icon image indicating a bearing from the current position to the destination, and producing a sound effect in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[0013]

With the above configuration, in the present invention, the current position of the mobile terminal device and the bearing to which the mobile terminal device is directed are sensed upon occasion by the position sensing means and the bearing sensing means of the mobile terminal device respectively. Then, the predetermined specific information to identify the destination and the positional information of the present address are transmitted to the server system that provides the map information. The map information of a section containing the destination and the present address are provided from the server system, and the mobile terminal device acquires these information. The target bearing calculating means calculates the bearing from the current position to the destination from the positional information of the present address sensed by the position sensing means and the specific information of the destination. While, the displaying means displays the map based on the acquired map information, displays predetermined icon images at the position of the destination and the current position respectively, and displays the icon image indicating the bearing which is sensed by the bearing sensing means and to which the mobile terminal device is directed, or alternately the displaying means displays the map, displays the predetermined icon image on the map to overlap with

at least in the current position sensed by the position sensing means, and displays the icon image indicating the bearing which is sensed by the bearing sensing means and to which the mobile terminal device is directed and an icon image indicating the bearing which is calculated by the target bearing calculating means from the current position to the destination. Then, the target capturing means produces the sound effect in response to the difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[0014]

As described above, in the present invention, the user can visually catch easily the geographical positional relationship by displaying the map, the above icon images, etc.

Also, the map information acquired from the server system contains the destination and the present address. Therefore, when the user is going to proceed from the user's bearing to the destination, the downloading of the map information is required only once and the downloading of the map information is never required plural times.

Also, the sound effect is produced in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed. Therefore, the user can aurally grasp easily the direction toward the destination.

[0015]

Also, in the invention set forth in Claim 3, as described above, different melodies are sound in response to the difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed. Therefore, the user can aurally catch easily the direction toward the destination.

Also, in the invention set forth in Claim 4, as described above, when the bearing from the current position to the destination coincides with the bearing to which the mobile terminal device is directed, the icon image displayed at the

position of the destination is blinked. Therefore, the user can visually catch easily that the current direction coincides with the direction toward the destination.

In this case, it is preferable that at least latitude/longitude information of that place should be contained in the above positional information.

[0016]

[Mode for Carrying Out the Invention]

An embodiment of the present invention will be explained with reference to the drawings hereinafter.

FIG.1 is a view showing a schematic configuration of a route guiding system utilizing a mobile terminal device as an embodiment of the present invention. In this case, in the present embodiment, the mobile terminal device is constructed by utilizing the conventional mobile phone. The mobile terminal device is not limited to the mobile phone, and PHS (trade mark) (Personal Handyphone System), radio-communicable mobile information terminal (PDA: Personal Digital Assistant), etc. may also be applied. Also, a server 2 described in the following is constructed by utilizing a so-called server computer.

[0017]

As shown in FIG.1, a mobile phone 1 in the present embodiment is connected to a server 2 in a GPS base station via a radio communication network. A position DB 3 and a map DB 4 are connected to the server 2. Specific information used to identify the location as the destination (here, the shop, the institution, etc. are selected as the object) and its latitude/longitude as positional information of the location are correlated mutually and registered in the position DB 3. Sets of map image data and positional information (latitudes/longitudes) of predetermined positions (e.g., the upper end/the lower end and the right end/the left end, etc. of the map) on the map image as the information to identify the position on the map are registered in plural areas in the map DB 4. In reply to the request transmitted from the mobile phone 1, this server

2 streams positional information of the destination and map information consisting of map image data containing the destination and the current position and positional information of predetermined positions into the mobile phone 1 (details will be described later).

[0018]

In this case, a configurative example of the data registered in the position database 3 is shown in FIG.2. The destination name, the group name (characters used to classify a category of business/a business condition of the destination, for example, S represents the shop, R represents the restaurant when first letters of the names representing the category of business/the business condition are employed), the phone number and URL (Uniform Resource Locator) are contained in the specific information that are registered in the position database 3 (where, names of the destinations are registered in the item column in FIG.2). Here, the reason why the group names are employed is given as follows. That is, for example, often the numerals are used in the phone number registration of the mobile phone to classify the destinations into groups, but the user cannot see what contents are registered in the group numbers because the numerals are not associated with contents of the groups. Therefore, the destinations are classified into groups by the names being associated with the contents of the groups in such a manner that SHOP is represented by S, RESTAURANT is represented by R, and so on, which makes the management easy.

[0019]

As described above, the above specific information and corresponding latitude/longitude are registered in the position database 3. Therefore, since the user can designate the destination by using the phone number or the URL (normally the user can know them via the medium such as the advertisement, and so forth) of the destination, the pointing of the latitude/longitude is not required of the user to designate the destination.

In this case, in case the specific information

transmitted from the mobile phone 1 to identify the destination are the positional information, the position database 3 may be omitted.

[0020]

Next, a configuration of the above mobile phone 1 will be explained with reference to FIG.3 hereunder.

As shown in FIG.3, the mobile phone 1 includes a mobile phone function block 10, a GPS module 11, a sound source module 12, a geomagnetic bearing sensor 13, a controller 14, a ROM 15, and a RAM 16. The mobile phone function block 10 has a communication module 10a used to communicate with the radio communication network as the mobile phone, a key board 10b as an inputting means, and an LCD display panel 10c as a displaying means. The GPS module 11 acquires position measuring data obtained from the GPS (Global Positioning System) satellite or the GPS base station. The sound source module 12 receives supply of melody data offered under predetermined conditions (containing the case of call incoming of the phone) and reproduces this melody data (in the case of call incoming of the phone, reproduces a ringing tone), and is constructed by an FM sound source, or the like. The geomagnetic bearing sensor 13 outputs a sensed signal in response to the direction along which the sensor is directed (i.e., the concerned mobile phone 1 is directed).

[0021]

In this case, the above GPS module 11 has a function of measuring the current position of the mobile phone 1 based on the D-GPS position measuring system (differential D-GPS position measuring system). The GPS base station is used as the fixed station of the D-GPS position measuring system. The position measuring data acquired by the GPS module 11 is transmitted to the GPS base station. The precise position measuring calculation is carried out in this GPS base station, and then the resultant positional information (the latitude/the longitude) of the present address are returned to the mobile phone 1. When doing this, a position measuring calculation in

the mobile phone 1 is omitted, so that not only the following load of the controller 14 can be reduced but also improvement of a position measuring precision and a reduction of a position measuring time can be achieved. In this case, in order to accept the D-GPS position measuring service, the GPS base station as the fixed station must be located within almost several tens Km from the mobile phone. In contrast, since the position measuring on the mobile phone 1 side can get a sufficient precision at present not to employ the D-GPS position measuring system, position measurement by this D-GPS position measuring system is not always needed. In this case, such an advantage can be obtained that there is no need to transmit the position measuring data from the mobile phone 1 to the GPS base station.

[0022]

The controller 14 controls respective portions of the mobile phone 1 based on a control program (details associated with the present invention will be described later). In this case, when the latitude/longitude of the current position are measured by the mobile phone 1, this controller 14 calculates such latitude/longitude based on the position measuring data given from the GPS module 11. Also, an angle of the bearing to which the mobile phone 1 is directed (azimuth angle: an angle to a reference bearing (e.g., North bearing)) is calculated by the controller 14 based on the sensing signal supplied from the geomagnetic bearing sensor 13. These calculations can be carried out in the same manner as the calculation of the position measurement of the current position or the direction executed by the navigation system or the electronic compass utilizing the GPS in the prior art.

[0023]

Also, the above control program, current position icon data indicating the current position on the map and target position icon data indicating the position of the destination, current bearing icon data indicating the direction of the mobile phone 1 (having a display mode by an arrow), melody data to produce various melodies played under predetermined conditions,

the address of the server 2, and so on are stored in the ROM 15 shown in FIG.3. Also, the phone number or URL of the destination input by the user, the derived positional information of the current position and the azimuth angle in which the mobile phone 1 is directed, the target bearing described later, and so on are stored in the RAM 16.

[0024]

Next, an operation of a route guiding system utilizing the mobile phone 1 constructed in this manner will be explained with reference to operational flowcharts in FIGS.4 to 6 hereunder.

In this case, the operational flowcharts explained in the following are an example, and the present invention is not restricted to following flow of the processes.

[0025]

At first, the user inputs the phone number or URL as the specific information of the destination (here, SHOP A) by using the mobile phone 1, and transmits a request for the positional information containing this information (positional information request) to the GPS base station (step S11). The server 2 receives the positional information request sent from the mobile phone 1. The server 2 searches the positional information corresponding to a search key in the position database 3 while using the received phone number, URL, or the like as the search key, and then sends back the positional information obtained by the search to the mobile phone 1.

[0026]

The mobile phone 1 receives the positional information of the destination from the GPS base station, and then stores the positional information in RAM 16 (step S12). In the example shown in FIG.3, the derived positional information (latitude: 38.57, longitude: 135.54) of the destination are stored in the latitude and longitude columns (③ and ④) in the row of the item SHOP A.

Then, the mobile phone 1 measures the current position (step S13). Here, the mobile phone 1 gets the position

measuring data acquired by the GPS module 11, and then sends a request for the position measurement containing the position measuring data (position measuring request) to the GPS base station. The GPS base station, when received this position measuring request, calculates the latitude/ the longitude based on the received position measuring data, and then sends back the data (positional information of the present address) to the mobile phone 1.

[0027]

The mobile phone 1 receives the positional information of the present address from the GPS base station, and stores this positional information in the RAM 16 (step S14). In the example shown in FIG.3, the derived positional information (latitude: 37.45, longitude: 135.01) of the present address are stored in the latitude and longitude columns (① and ②) in the row of the item ME.

Then, an azimuth angle in which the mobile phone 1 is directed is measured by the geomagnetic bearing sensor 13 (step S15). Here, the controller 14 calculates the azimuth angle based on the sensing signal of the geomagnetic bearing sensor 13. The calculated present azimuth angle θms is stored in the RAM 16. In the example shown in FIG.3, the derived present azimuth angle (present bearing: 60 deg) is stored in the azimuth angle column (⑤) in the row of the item ME.

[0028]

Then, the mobile phone 1 requests the GPS base station to send the map information containing the position of the destination (target position) and the position of the present address (current position) (step S16). At this time, a map information acquiring request is sent from the mobile phone 1 to the server 2. The server 2, when received this map information acquiring request, searches the map database 4 based on the latitude/the longitude of the target position and the current position to get the map information containing the target position and the current position, and then sends back this map information to the mobile phone 1.

[0029]

Now, a method of selecting the map information containing the map image data in a predetermined area including the target position and the current position by the server 2 will be explained with reference to FIG.7 hereunder.

Like an example shown in FIG.7, when the target position is positioned on the Northeast side of the current position, a latitude line A derived by adding 20 minutes to latitude data of the target position and a longitude line D derived by adding 20 minutes to longitude data of the target position are obtained. Also, a latitude line B derived by subtracting 20 minutes from latitude data of the current position and a longitude line C derived by subtracting 20 minutes from longitude data of the current position are obtained. In this manner, the addition/ the subtraction applied to select the map image data in a predetermined area are executed appropriately in response to a positional relationship between the target position and the current position such that a range surrounded by lines corresponding to the above lines A, B, C, D contains the target position and the current position. In the neighboring area of Japan, 20 minutes of the latitude/the longitude corresponds to a distance of about 500 m on the map, and the range surrounded by the lines A, B, C, D corresponds to the map area that contains a circumference 500 m of the range, on a diagonal line of which the target position and the current position are positioned. The map image data containing the range surrounded by the lines A, B, C, D are searched from the map database 4, and map information of the area containing this range are obtained.

[0030]

In this case, as described above, numerical values applied to select the map area by adding/subtracting the latitude/the longitude (20 minutes in the above example) may be set arbitrarily in compliance with the scale and the area of the map, and the necessary map area may be downloaded. Accordingly, it is possible to get immediately the optimum map area containing the target position and the current position

of the user. Therefore, such troublesomeness in the prior art can be improved that first the wide area map must be downloaded and then the area of the map must be reduced several times by using the zoom-in function to get the map range containing the target position and the user's own current position, or the map with different scales must be downloaded several times.

[0031]

The mobile phone 1 downloads the map information that are selected by searching the map database 4 via the server 2 as above (step S17).

Then, as shown in FIG.9, the mobile phone 1 displays a target position icon (a symbol a in FIG.9) and a current position icon (a symbol b in FIG.9) on the LCD panel 10c to overlap with positions on the map corresponding to latitudes/longitudes of the target position derived in above steps and the current position respectively, and displays a current bearing icon (a symbol c in FIG.9) to overlap with the current position icon (step S18).

[0032]

Next, calculation of the target bearing is started. In forgoing steps S12, S14 and step S15, the latitude/longitude of the target position, the latitude/longitude of the current position, and the current azimuth angle were derived, and thus these data are used. In the example shown in FIG.3, the target position (latitude 2, longitude 2)=(38.57, 135.54) and the current position of the user by the GPS position measurement (latitude 1, longitude 1)=(37.45, 135.01) are derived.

[0033]

First, a difference a (=④-②) between the target longitude (longitude ④ of the destination SHOP A) and the present longitude (longitude ② of the current position (ME)) and a difference b (=③-①) between the target latitude (latitude ③ of the destination SHOP A) and the present latitude (latitude ① of the current position (ME)) are calculated (step S19). In the example shown in FIG.8, a=the longitude 2-the longitude 1=38.57-37.45=1.12 and b=the latitude 2-the

latitude 1=135.54-135.01=0.53 are calculated.

Then, a target bearing θ=arctan(b/a) and a relative bearing $\Delta\theta$=(90 deg-θms)-θ are calculated by using a, b calculated in step S19 (step S20). Here, the target bearing θ is a bearing directed from the current position to the target position (where an azimuth angle from the East bearing), the current bearing θms is a current azimuth angle of the mobile phone 1 as described above (where an azimuth angle from the North bearing), and the relative bearing $\Delta\theta$ is a difference between the current bearing and the target bearing. In this case, an area in which a magnitude of $\Delta\theta$ is 1 deg or less may be set arbitrarily.

[0034]

Then, in the decision in step S21, if the relative bearing $\Delta\theta$ calculated previously is a predetermined positive value (where this value is assumed as "1") or less, the process goes to step S22 wherein a melody 1 flag is set to "1". In this case, this melody 1 flag is a flag indicating that melody data of a melody 1 should be reproduced and an initial value is set to "0".

Then, in step S23, because the melody 1 flag is set to "1", the controller 14 supplies the melody data of the melody 1 to the sound source module 12 to reproduce the melody 1. Then, the process goes to step S26.

[0035]

In contrast, in the decision in step S21, if the relative bearing $\Delta\theta$ calculated previously is "0", the process goes to step S24 wherein a melody 2 flag and a blink flag are set to "1" respectively. In this case, this melody 2 flag is a flag indicating that melody data of a melody 2 should be reproduced, and this blink flag is a flag indicating that the target position icon should be highlight-blinked. These initial values are set to "0" respectively.

Then, in step S25, because the melody 2 flag is set to "1" and the blink flag is set to "1", the controller 14 supplies the melody data of the melody 2 to the sound source module 12

to reproduce the melody 2. Also, the controller 14 controls to highlight-blink the target position icon displayed on the LCD display panel 10c. Then, the process goes to step S26.

[0036]

In contrast, in the decision in step S21, if the relative bearing $\Delta\theta$ calculated previously is larger than the predetermined positive value (where this value is "1"), the process goes to step S26. In this stage in step S26, if the user changes the user's own position or direction, i.e., changes the position or direction of the mobile phone 1, processes in step S13 et seq. are further executed. In this case, in step S26, movement and change of the direction of the user may be sensed by the GPS module 11 or the geomagnetic bearing sensor 13, otherwise the processes in step S13 et seq. may be carried out irrespective of change of the position or the direction after a predetermined time has lapsed.

[0037]

With the above, the embodiment of the present invention is explained in detail with reference to the drawings. But particular configuration is not limited to this embodiment, and configurations in the scope that does not depart from the gist of the present invention may be contained. For example, in the above embodiment, the map and the icon are displayed in such a manner that the overall map of the map being downloaded from the server 2 is displayed, then the target position icon and the current position icon are displayed on the map to overlap with the positions corresponding to the latitudes/longitudes of the target position and the current position on the map respectively, and the current bearing icon is displayed to overlap with the current position icon. However, as shown in FIG.10, a part of the map containing the current position (in an area encircled by a dotted line in FIG.10) may be displayed on the LCD panel 10c, a current position icon (a symbol b in FIG.10) may be displayed on the map to overlap with the position corresponding to the latitude/longitude of the current position, a current bearing icon (a symbol c in FIG.10) and a target bearing

icon (a symbol d in FIG.10) indicating the target position may be displayed to overlap with the current position icon, and the displayed area of the map may be shifted/updated following to the movement of the user. In this case, when the target position enters into the displayed area according to the movement of the user, the target position icon is displayed on the map to overlap with the corresponding position. When doing this, the map can be displayed in appropriate size on the mobile terminal device such as the mobile phone having a small display screen, etc. even if the area of the downloaded map is wide.

[0038]

[Advantages of the Invention]

As described in detail above, according to the present invention, the direction along which the user should go to the pointed destination is instructed by the image display and the sound effect, based on the current position and the direction of the user who utilizes the mobile terminal device of the present invention. Therefore, the user can catch easily the proceeding direction even when such user does not know how to read the map, and can start immediately to walk to the destination.

Also, the map information acquired from the server system contains the destination and the present address. Therefore, when the user is going to proceed from the user's bearing to the destination, the downloading of the map information is required only once and the downloading of the map information is never required plural times.

[Brief Description of the Drawings]

[FIG.1] A view showing a schematic configuration of a route guiding system utilizing a mobile terminal device as an embodiment of the present invention.

[FIG.2] A view showing a configuration of data registered in a position database in the embodiment.

[FIG.3] A block diagram showing a schematic configuration of a mobile phone in the embodiment.

[FIG.4] A part of an operational flowchart of the mobile phone in the embodiment.

[FIG.5] A part of an operational flowchart of the mobile phone in the embodiment.

[FIG.6] A part of an operational flowchart of the mobile phone in the embodiment.

[FIG.7] A view explaining a method of selecting map information containing map image data in a predetermined area including a target position and a current position by the server, in the embodiment.

[FIG.8] A view showing relationships among a current bearing θms, a target bearing θ, a relative bearing $\Delta\theta$, etc.

[FIG.9] An example of a display screen in the embodiment.

[FIG.10] An example (another example) of a screen display of the mobile terminal device.

[Description of Reference Numerals and Signs]

1 ... mobile phone (mobile terminal device), 2 ... server (server system), 3 ... position database (position DB), 4 ... map database (map DB), 10 ... mobile phone function block, 10a ... communication module (a part of a map information acquiring means), 10b ... key board, 10c ... LCD display panel (displaying means, a part of a target capturing means), 11 ... GPS module (position sensing means), 12 ... sound source module (a part of the target capturing means), 13 ... geomagnetic bearing sensor (bearing sensing means), 14 ... controller (a part of the map information acquiring means, a target bearing calculating means, a part of the target capturing means), 15 ... ROM, and 16 ... RAM.

[Designation of Document] Abstract

[Abstract]

[Problem] To provide a mobile terminal device having a route guiding function of permitting the user to simply know a direction of a target based on user's current position and direction, and a route guiding method utilizing the mobile terminal device.

[Means for resolution] There are provided a means for sensing a current position, a means for sensing a directed bearing, a means for transmitting predetermined specific information to identify a destination and positional information of a present address to a server system and acquiring map information of a section containing the destination and the present address from the server system, a means for calculating a bearing from a current position to the destination from the positional information of the present address and the specific information of the destination, a means for displaying a map based on acquired map information, displaying predetermined icon images at a position of the destination and the current position respectively and displaying an icon image indicating a bearing to which the mobile terminal device is directed, and a means for producing a sound effect in response to a difference between the bearing from the current position to the destination and the bearing to which the mobile terminal device is directed.

[Selected Drawing] FIG.3

Fig. 1

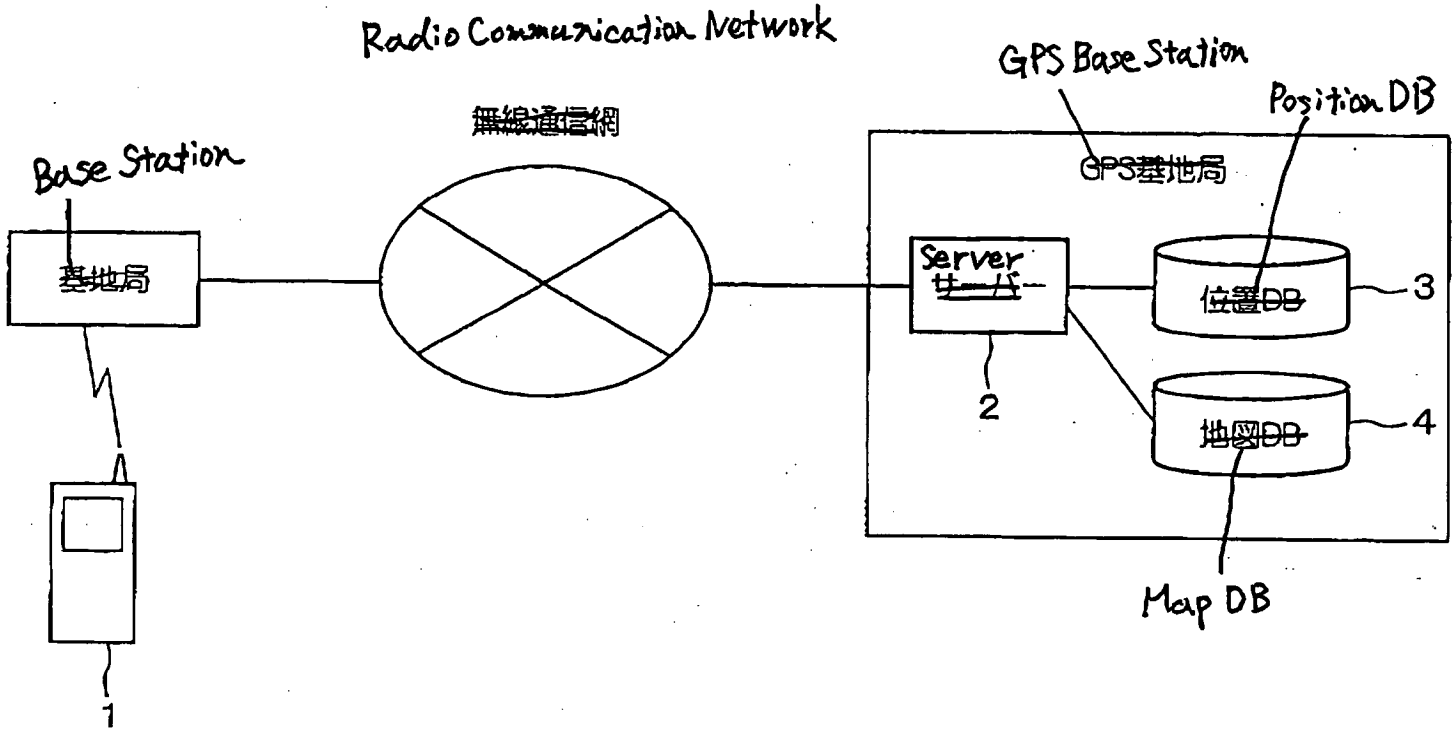

Radio Communication Network
無線通信網
GPS Base Station
Position DB
Base Station
GPS基地局
基地局
Server
サーバ
位置DB
3
2
地図DB
4
Map DB
1

Fig.2

Position Database
~~位置データベース~~

Item ~~アイテム~~	Group ~~グループ~~	Phone No. ~~電話番号~~	URL	Latitude ~~緯度~~	Longitude ~~経度~~
SHOP A	S	03-3333-0000	www.shopa.com	38.57	135.54
SHOP B	S	03-3333-0001	www.shopb.com	45.63	138.73
RESTAURANT C	R	03-3333-0002	www.restc.com	35.36	125.61
⋮	⋮	⋮	⋮	⋮	⋮

~~図2~~

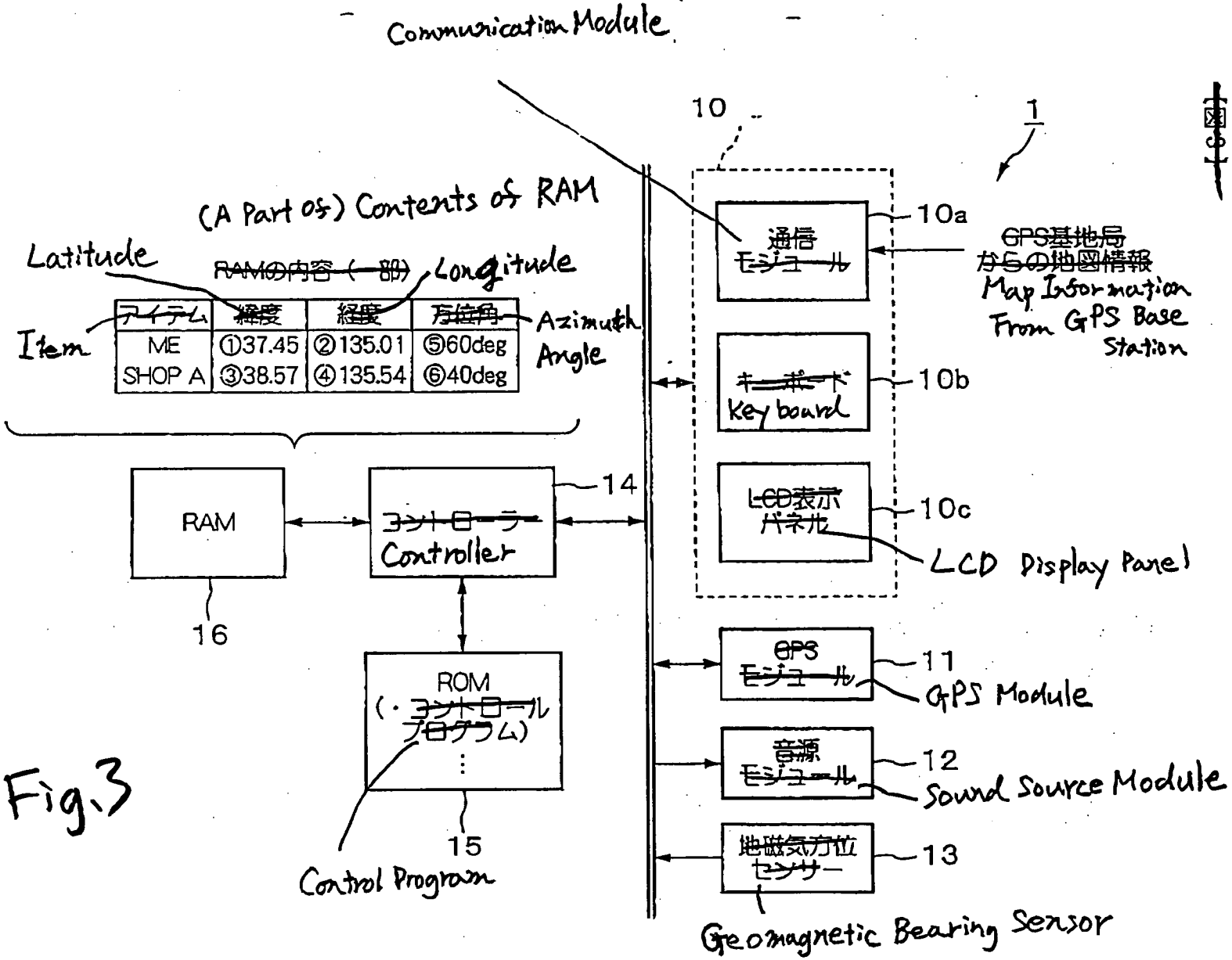
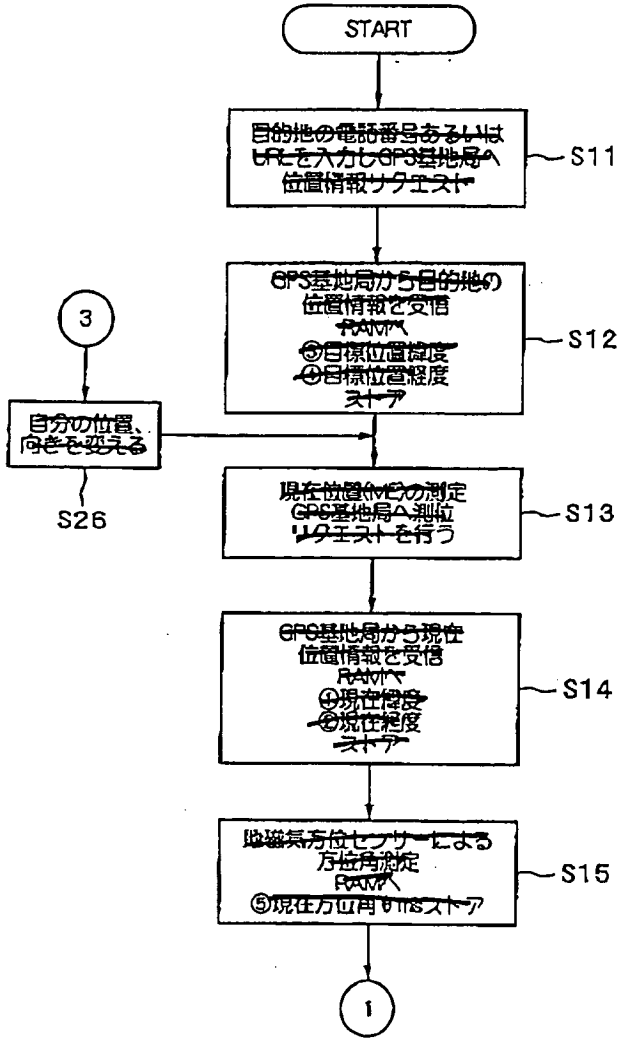

Communication Module
10
1
(A Part of) Contents of RAM
Latitude
RAMの内容（一部）
Longitude
アイテム
緯度
経度
方位角
Item
Azimuth Angle
ME
①37.45
②135.01
⑤60deg
SHOP A
③38.57
④135.54
⑥40deg
通信モジュール
10a
GPS基地局からの地図情報
Map Information From GPS Base Station
キーボード
Key board
10b
LCD表示パネル
10c
LCD Display Panel
RAM
コントローラー
Controller
14
16
ROM
(・コントロールプログラム)
15
Control Program
GPSモジュール
11
GPS Module
音源モジュール
12
Sound Source Module
地磁気方位センサー
13
Geomagnetic Bearing Sensor

Fig.3

（図4）

Fig. 4



S11 input a phone number or URL of the destination, request a GPS base station to send positional information

S12 receive the positional information of the destination from the GPS base station, store ③ target position latitude ④ target position longitude in RAM

S13 measure the current position (ME), issue a position measuring request to the GPS base station

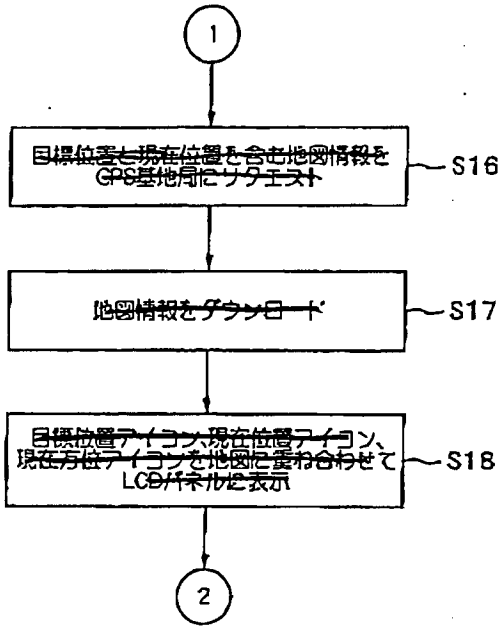
S14 receive current positional information from the GPS base station, store ① present latitude ② present longitude in RAM (S14)

S15 measure an azimuth angle by a geomagnetic bearing sensor, store ⑤ present azimuth angle θms in RAM

S26 change the user's own position or direction

[redacted]

Fig. 5



S16 request the GPS base station to send map information containing the target position and the current position

S17 download the map information

S18 display a target position icon, a current position icon, a current bearing icon on an LCD panel to overlap mutually on a map

【図６】

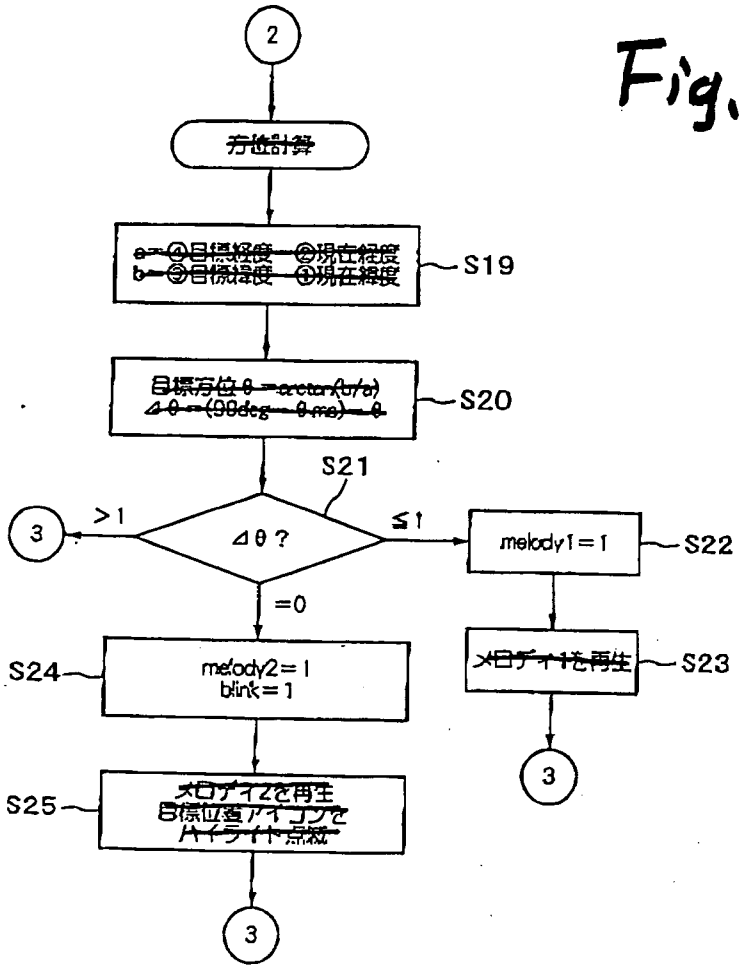


Fig. 6

bearing calculation

S19 a=④ target longitude-② present longitude,
b=③ target latitude-① present latitude (S19)

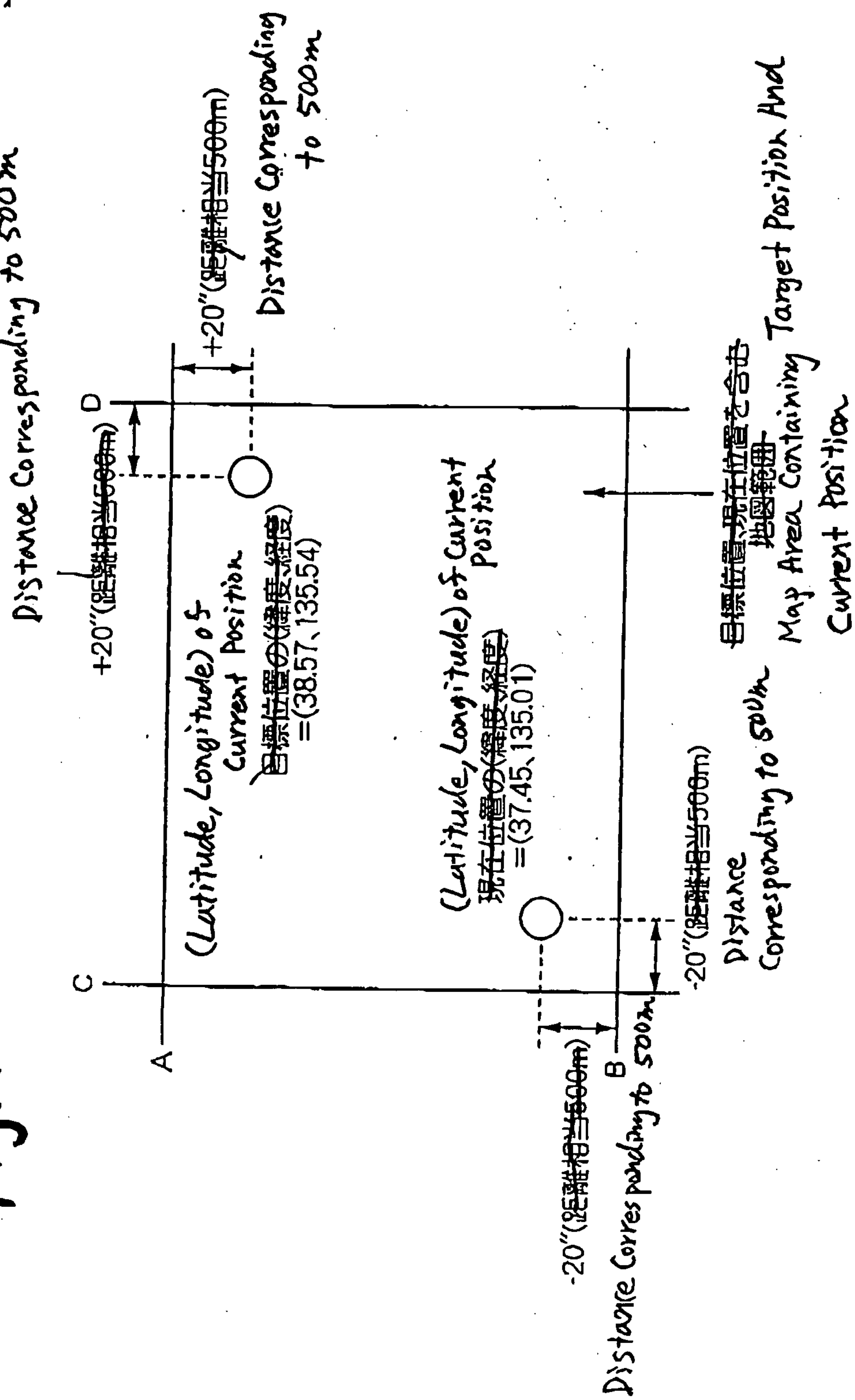
S20 target bearing θ =arctan(b/a) $\Delta\theta$ =(90 deg- θ ms)- θ

S23 reproduce a melody 1

S25 reproduce a melody 2, highlight the target position icon by blinking

【図7】

Fig. 7


A
B
C
D
+20"(距離相当500m)
Distance Corresponding to 500m
+20"(距離相当500m)
Distance Corresponding to 500m
-20"(距離相当500m)
Distance Corresponding to 500m
-20"(距離相当500m)
Distance Corresponding to 500m
目標位置の(緯度、経度)=(38.57、135.54)
(Latitude, Longitude) of Current Position
現在位置の(緯度、経度)=(37.45、135.01)
(Latitude, Longitude) of Current Position
目標位置、現在位置を含む地図範囲
Map Area Containing Target Position And Current Position

【図8】

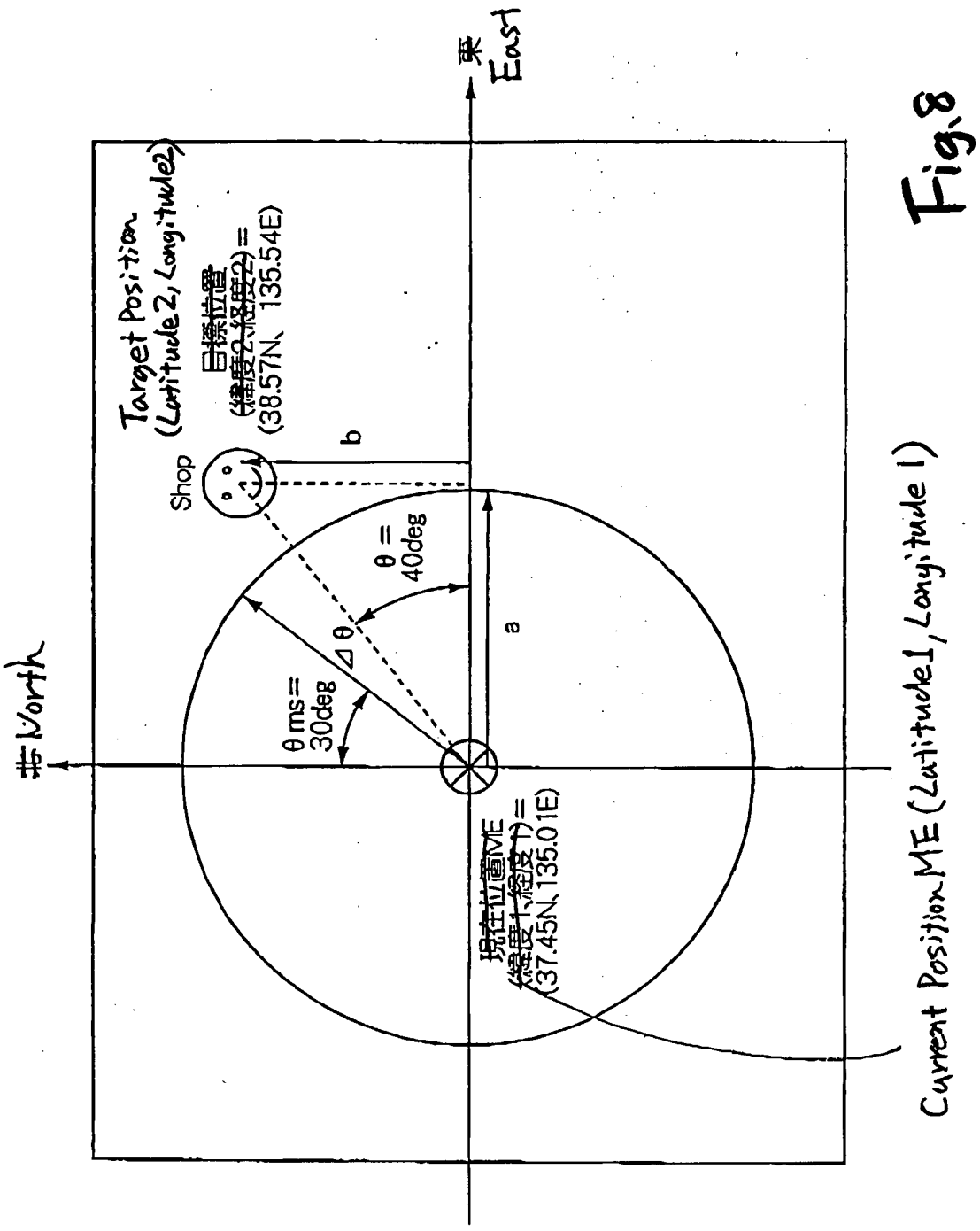
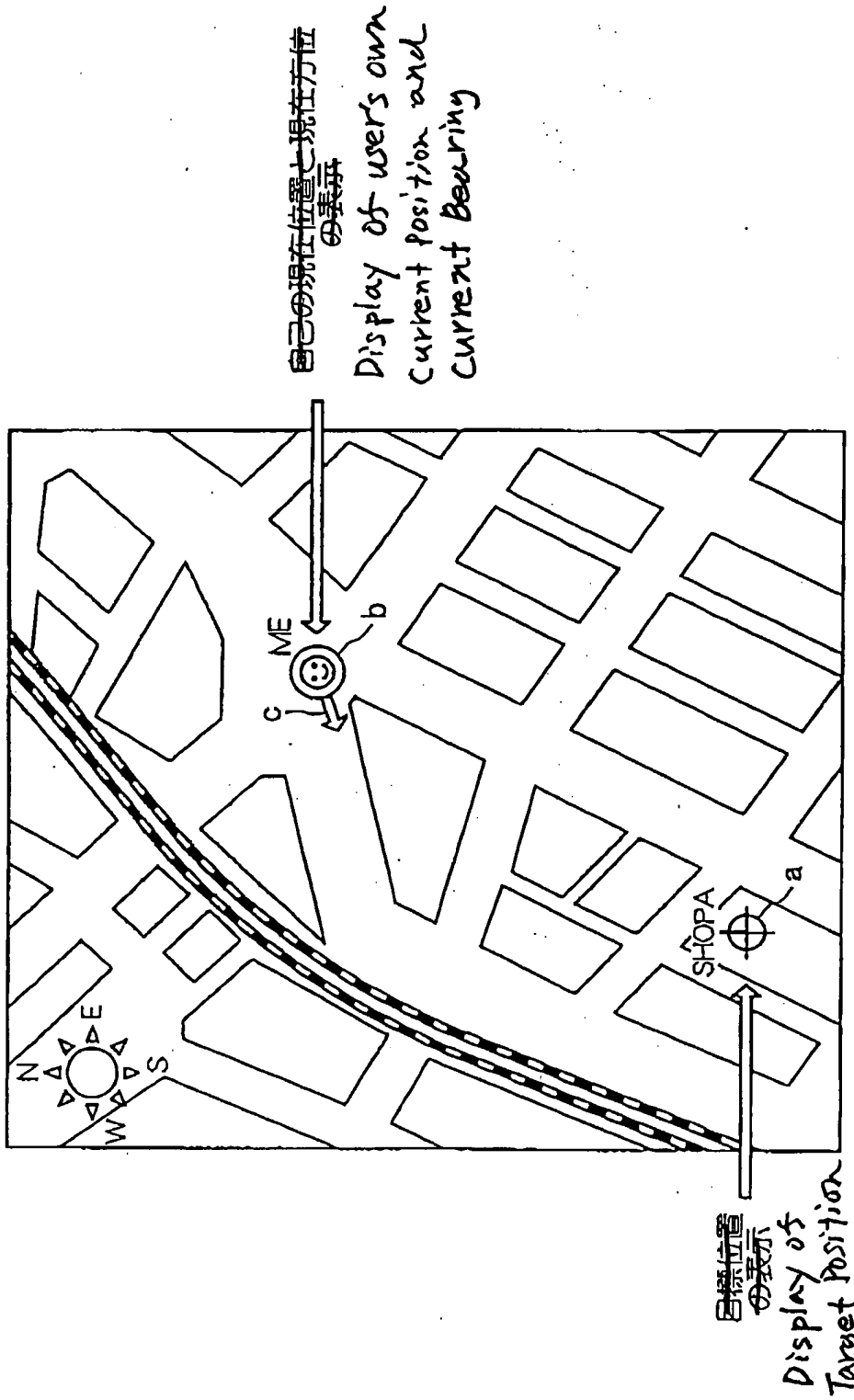

東
East
北
North
Target Position
(Latitude2, Longitude2)
目標位置
(緯度2,経度2)=
(38.57N, 135.54E)
Shop
b
θ =
40deg
Δθ
θms=
30deg
a
現在位置ME
(緯度1,経度1)=
(37.45N, 135.01E)
Current Position ME (Latitude1, Longitude1)

Fig.8

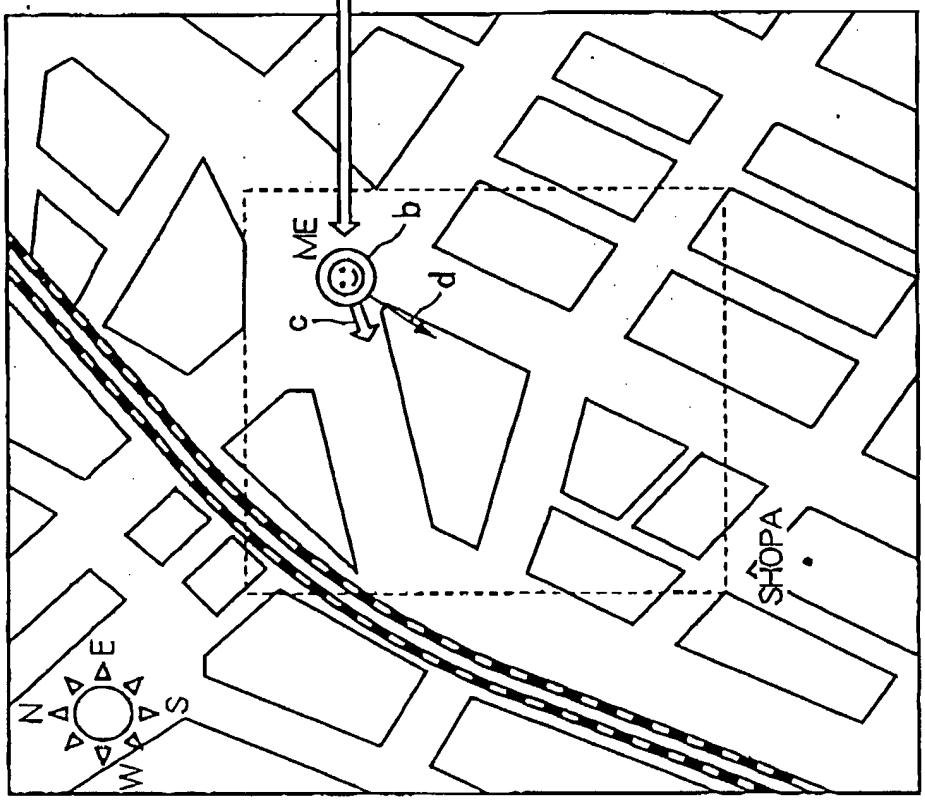
【図９】

Fig.9


自己の現在位置と現在方位の表示
Display of user's own current position and current bearing
ME
b
c
SHOPA
a
N
E
S
W
目標位置の表示
Display of Target Position

【図10】

Fig.10


自己の現在位置と現在方位と
目標方位の表示
Display of User's Own Current
Position, Current Bearing and
Target Bearing
ME
b
c
d
SHOPA
N
E
S
W